Fact Sheet

United States Nuclear Regulatory Commission
Office of Public Affairs
Washington DC 20555
Telephone: 301/415-8200 E-mail: opa@nrc.gov

Tritium

Background

Tritium, an essential material in U.S. nuclear weapons, is an isotope of hydrogen that decays at a rate of about five percent per year (half of it decays in about 12 years). Thus, tritium must be replenished in nuclear weapons routinely. The United States has not produced tritium since 1988, when the Department of Energy's (DOE's) production facility at the Savannah River site in South Carolina closed. Immediate tritium needs are being met by recycling tritium from dismantled U.S. nuclear weapons. According to DOE, resumption of tritium production is essential for maintaining the U.S. nuclear weapons stockpile.

DOE's Strategy for the Production of Tritium

DOE is responsible for re-establishing the capability to produce tritium gas by the end of 2005, in accordance with a Presidential directive. As part of a dual-path strategy, DOE considered two options for producing tritium. One involved the use of a linear accelerator, which does not require NRC approval. A second option, using a commercial nuclear power plant, however, does require NRC review.

On May 22, 1996, the Secretary of Energy and the Chairman of the Nuclear Regulatory Commission signed a joint memorandum of understanding that establishes the basis for NRC review and consultation regarding DOE's use of commercial reactors for producing tritium. The memorandum supplements a 1978 agreement between DOE and NRC and relates solely to tritium production.

DOE has developed a technology for producing tritium in pressurized water reactors that uses lithium, rather than boron (which is normally used), as a neutron absorber. As a result of irradiation by neutrons in the reactor core, lithium in special rods will be converted to tritium. The rods can then be removed from the fuel assemblies and shipped to the Savannah River site where the tritium will be extracted by DOE.

Commercial Light Water Reactor Production of Tritium

In the first phase of the tritium program, NRC evaluated DOE’s proposal for testing irradiation of a limited number of fuel assemblies containing tritium-producing burnable absorber rods (TPBARs) in a commercial nuclear reactor. Results of the review were documented in NUREG-1607, which is available to the public. This test or demonstration proposed placing 32 lithium rods in a reactor core during one fuel cycle. The DOE contracted with the Tennessee Valley Authority to conduct a one-time confirmatory test at the Watts Bar nuclear power plant near Spring City, Tennessee. In April 1997, TVA applied for an amendment to the Watts Bar

facility operating license. NRC issued a license amendment to TVA in September 1997 that authorized a test for irradiation of the tritium-producing rods.

The lithium rods were loaded in the core during Watts Bar's first refueling outage and irradiation began the next month. The 32 tritium-producing rods were irradiated and were removed from the reactor during the spring 1999 outage. The rods were shipped offsite by DOE and will be subjected to nondestructive examination and destructive post-irradiation examination to confirm TPBAR design methodology and to provide information to test the analytical modeling and modeling assumptions.

The second phase focuses on production of tritium and involves NRC assisting DOE in assessing and resolving technical and licensing issues involved in using commercial reactors for tritium production. The NRC has reviewed DOE's safety assessments that were submitted in a topical report. The NRC's safety evaluation, issued as NUREG-1672 in May 1999, documents the review and identifies plant-specific interface issues that must be addressed in support of license amendment requests seeking authorization to produce tritium.

The NRC must grant license amendments to TVA before the Watts Bar and Sequoyah plants can be used for tritium production. Requests for a license amendment, expected early in 2001, will be subject to an opportunity for a hearing. Current DOE plans call for the loading of production quantity numbers of TPBARS into the Watts Bar and Sequoyah 2 plants during their fall 2003 outages.

The first core load of production quantity lithium rods will be fabricated during 2002 and 2003. This schedule would permit irradiation, cooling, and shipment of the rods to the tritium extraction facility at the Savannah River site in the summer of 2005.

DOE Decision for Production of Tritium

On December 22, 1998, the Secretary of Energy announced that he had chosen the light water reactor technology as the primary means for tritium production; the accelerator design will be retained as a backup. He selected the Tennessee Valley Authority's Watts Bar and Sequoyah nuclear power plants in Tennessee as the preferred facilities for producing future supplies of tritium. (Before this announcement, DOE had also considered paying TVA for completion of its unfinished Bellefonte plant in Alabama in which to produce tritium).

Public Meetings

Two public meetings have been held to provide an opportunity for public comment on the technical issues of the confirmatory test and to inform the public of NRC activities early in the evaluation process. An initial meeting was held at NRC Headquarters in Rockville, Maryland in February 1997. Another public meeting was held near TVA's Watts Bar nuclear power plant in Tennessee in August 1997, prior to loading tritium-producing rods into the reactor core.

In addition, technical meetings that were open to the public were held on March 23 and August 24 this year between TVA and NRC to provide updates on the status of resolution of technical issues and on proposed schedules for licensing activities. Additional public meetings will be held at Watts Bar and Sequoyah before beginning tritium production.

December 2000